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# Discovery of *Paraboea minutiflora* (Gesneriaceae) from Southeast Yunnan, China with supplementary description

LU Zhaocen<sup>1</sup>, LIU Ende<sup>2</sup>, HAN Mengqi<sup>3</sup>, ZHU Xinxin<sup>4</sup>,  
NGUYEN Khang Sinh<sup>5</sup>, XU Weibin<sup>1\*</sup>

( 1. Guangxi Key Laboratory of Plant Conservation and Restoration Ecology in Karst Terrain, Guangxi Institute of Botany, Guangxi Zhuang Autonomous Region and Chinese Academy of Sciences, Guilin 541006, Guangxi, China; 2. Key Lab of Biodiversity and Biogeography, Kunming Institute of Botany, Chinese Academy of Sciences, Kunming 650201, China; 3. State Key Laboratory of Systematic and Evolutionary Botany, Institute of Botany, Chinese Academy of Sciences, Beijing 100093, China; 4. College of Life Sciences, Xinyang Normal University, Xinyang 464000, Henan, China; 5. Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology, Hanoi 10072, Vietnam )

**Abstract:** Sino-Vietnamese limestone karsts are biodiversity hotspots in the world and key areas for biodiversity conservation, and many new species of *Paraboea* have been found there recently. *Paraboea minutiflora* D. J. Middleton was collected firstly from northern Vietnam in 2001 and was published in 2018, but it is incomplete and lacks type specimens with mature flowers when reported. The description of *Paraboea minutiflora* was supplemented based on the collections from southeastern Yunnan, China and Ha Giang, Vietnam, and line drawing and photos are also provided. *Paraboea minutiflora* is most similar to *Paraboea glanduliflora* Barnett in having glabrous, reflexed calyx and corolla with glandular hairs, but differs from the latter by the upper leaf surfaces covered with brown matted indumentum when young, but glabrescent at maturity, the inflorescences terminal, the corolla 9–12 mm long, the capsule straight, 1.2 – 2.8 cm long. The discovery of *Paraboea minutiflora* from southeastern Yunnan, China demonstrates the flora is closely interrelated between the southern limestone karsts of China and the northern limestone karsts of Vietnam.

**Key words:** biodiversity hotspot, limestone flora, Sino-Vietnamese limestone karsts

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作者简介: 陆昭岑(1990–), 女, 广西容县人, 硕士, 主要从事植物分类学和民族植物学研究, (E-mail) zhaocenlu@163.com。

\* 通信作者: 许为斌, 博士, 研究员, 主要从事植物分类学和生物地理学研究, (E-mail) gxibwbxu@163.com。

# 微花蛛毛苣苔在中国云南的发现及其补充描述

陆昭岑<sup>1</sup>, 刘恩德<sup>2</sup>, 韩孟奇<sup>3</sup>, 朱鑫鑫<sup>4</sup>, NGUYEN Khang Sinh<sup>5</sup>, 许为斌<sup>1\*</sup>

( 1. 广西喀斯特植物保育和恢复生态学重点实验室, 广西壮族自治区 广西植物研究所, 中国 广西 桂林 541006; 中国科学院

2. 东亚植物多样性与生物地理学重点实验室, 中国科学院昆明植物研究所, 中国 昆明 650201;

3. 系统与进化国家重点实验室, 中国科学院植物研究所, 中国 北京 100093; 4. 信阳师范学院, 生命科学学院, 中国 河南 信阳 464000; 5. 越南科学技术研究院 生态与生物资源研究所, 越南 河内 10072 )

**摘 要:** 中越边境喀斯特地区是全球生物多样性热点地区,也是生物多样性保护的关键区域,近年来在该地区发现了多个蛛毛苣苔属植物的新种。微花蛛毛苣苔于 2001 年在越南北部喀斯特地区首次采集到标本,直到 2018 年才被发表出来,由于发表时仅基于一号花发育未成熟的标本,所以该物种的诸多形态特征仍不清楚。作者开展中越边境喀斯特地区植物多样性调查时,在我国云南东南部发现了微花蛛毛苣苔,并采集到花发育成熟的植株,对其进行了解剖观察和测量,现对该物种进行补充描述,并提供墨线图和野外生态照片以资辨认。微花蛛毛苣苔与腺花蛛毛苣苔在光滑无毛而反折的花萼以及被腺毛的花冠等形态上最相似,但不同之处在于微花蛛毛苣苔的叶上面幼时被褐色蛛丝状绵毛,后变近无毛,花序顶生,花冠长 9~12 mm,蒴果直,不旋扭,长 1.2~2.8 cm。微花蛛毛苣苔在滇东南的发现,说明中国南部喀斯特地区和越南北部喀斯特地区构成了一个完整的植物区系地理单元。

**关键词:** 生物多样性热点, 石灰岩植物区系, 中越边境喀斯特地貌

Sino-Vietnamese limestone karsts are biodiversity hotspots in the world (Myers et al., 2000; Clements et al., 2006), and many new species in the genus *Paraboea* (C.B. Clarke) Ridl. have been found there (Chen et al., 2008, 2012; Xu et al., 2012, 2017; Wen et al., 2013, 2016; He et al., 2018; Middleton, 2018). *Paraboea minutiflora* was reported from Ha Giang, northern Vietnam in 2018. But *Paraboea minutiflora* just only has slightly immature corollas on the specimens available for study when published (Middleton, 2018), so it is very important to give supplementary description for this insufficiently understood species. According to the original literature and specimens from southeastern Yunnan, China, the characteristics of *Paraboea minutiflora* are described, and line drawing and photos are also provided.

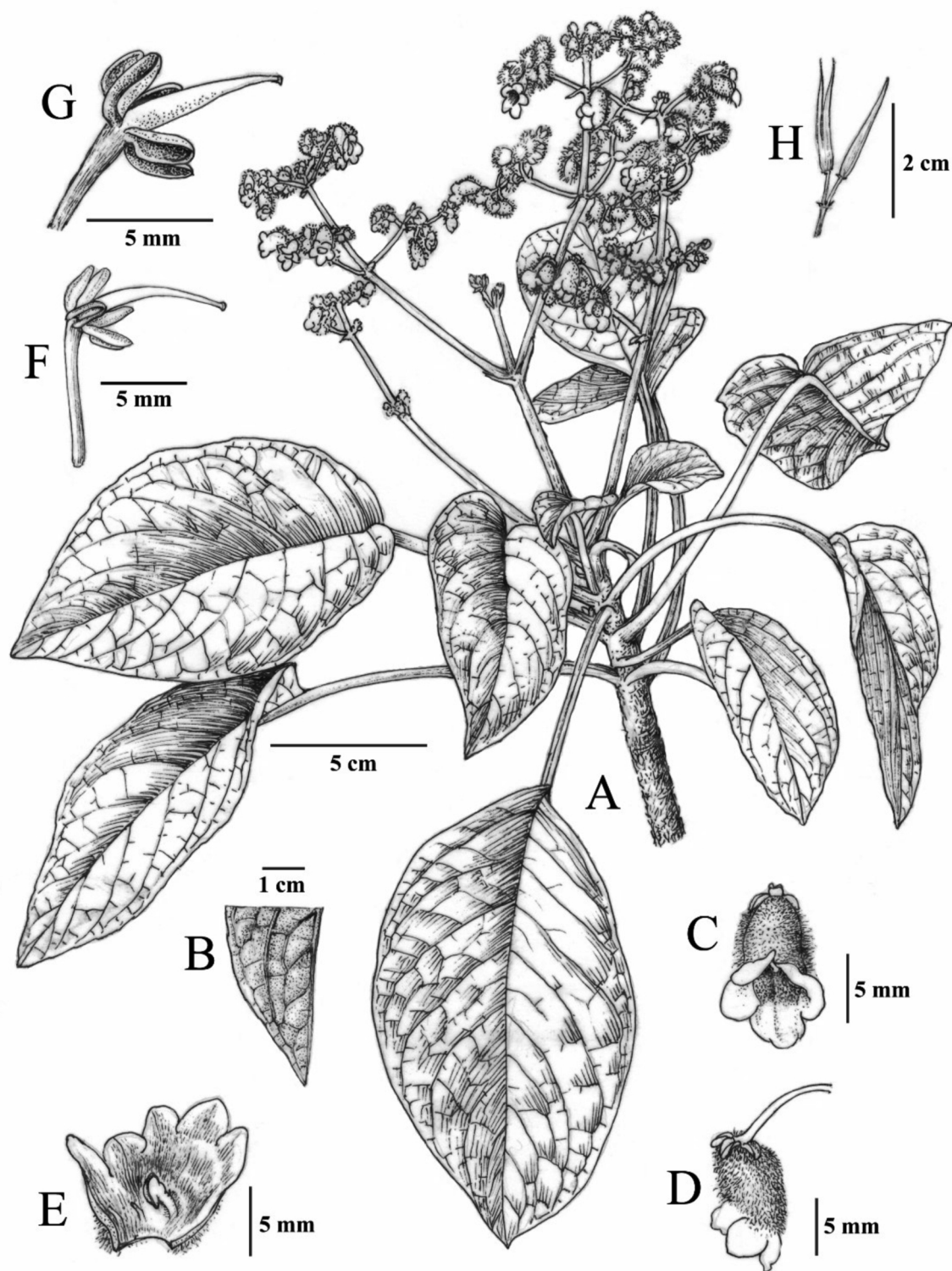
***Paraboea minutiflora*** D. J. Middleton in Edinb.

J. Bot., 75: 423. 2018.

微花蛛毛苣苔 (新拟) (Fig. 1, Fig. 2, Fig. 3)

Perennial erect herb with obviously (sometimes inconspicuous) woody rootstock. Rhizomes subterete,

14–40 cm long, 5–12 mm in diameter. Leaves 6–8, congested at the apex of rhizome, long petiolate, petiole 5.5–20 cm long, 1.5–4 mm in diameter, covered with grayish to brownish matted indumentum, leaf blade 9.4–19.4 × 5.7–19.2 cm, broadly lanceolate, ovate to broadly ovate, papery, base truncate to cordate, sometimes inequilateral, apex apiculate, cuspidate to almost rounded, margin entire to minutely crenulate, upper leaf surfaces covered with brown matted indumentum when young, but glabrescent at maturity, lower leaf surfaces with brown matted indumentum, lateral veins 7–9 on each side of midrib, flat adaxially and prominent abaxially, tertiary venation conspicuously reticulate on the lower leaf surface. Inflorescences cymose, terminal (rare subterminal), with distantly spaced branches, 26.1–36 cm long, 3–4-branched, ca. 30–100 flowers; peduncle 9.5–19 cm long, 5–10 mm in diameter, with a dense matted indumentum in lower parts, glabrescent distally, and then red-purple shiny; bracts 2, opposite, green, lower pair 11–41 × 5–29 mm, upper pairs progressively smaller; pedicels



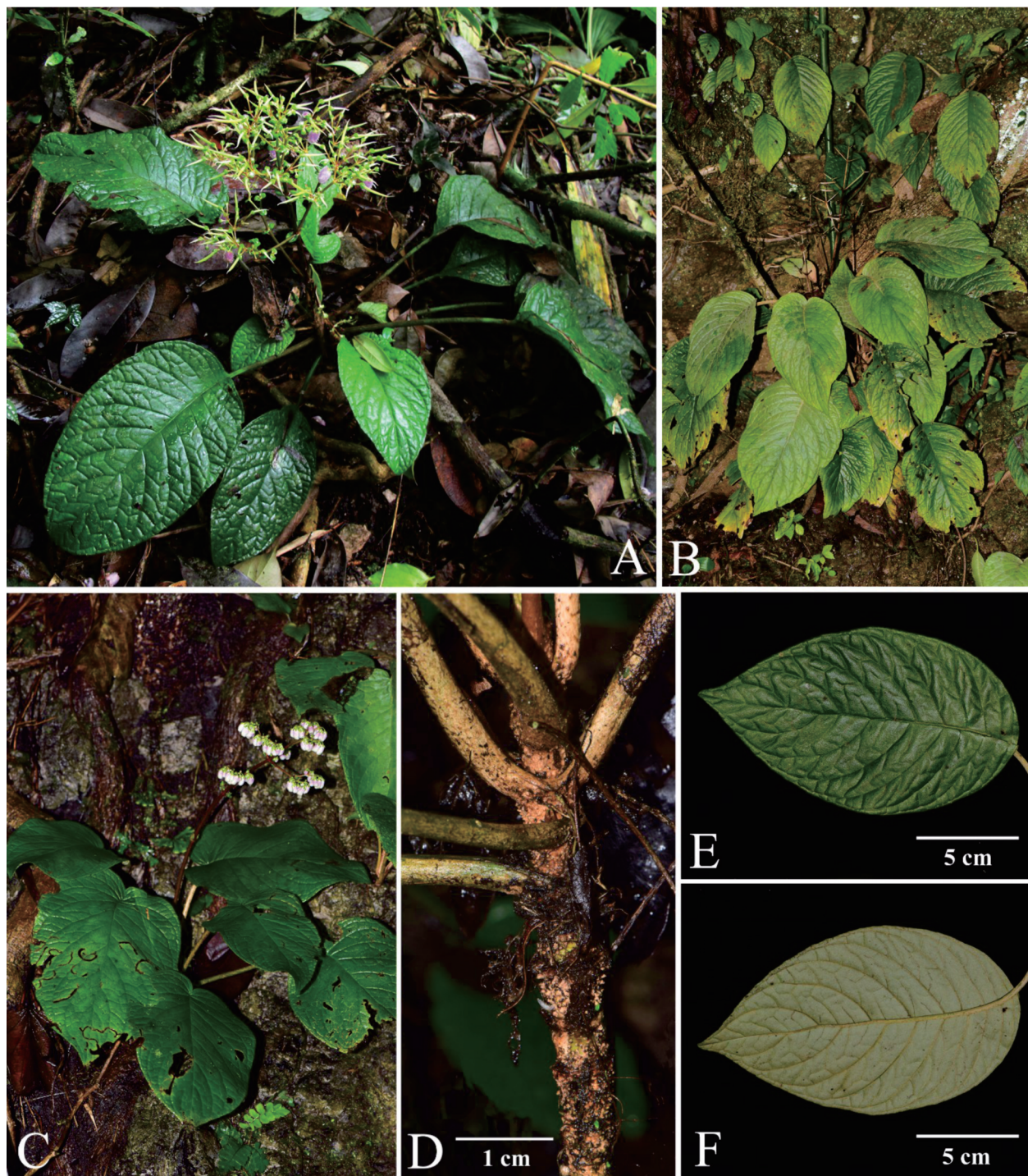
A. Habit; B. A part of lower surface of leaf blade; C. Flower face view; D. Flower side view; E. Opened corolla showing stamens and staminodes; F, G. Calyx and pistil; H. Capsules. (Drawn by W. H. Lin)

Fig. 1 *Paraboea minutiflora*

2–10 mm long, ca. 1 mm in diameter, glabrous. Calyx green, 5-parted nearly to the base, lobes

oblong, reflexed,  $3-3.5 \times 0.8-1.2$  mm, outside and inside glabrous, margins entire, apex rounded.





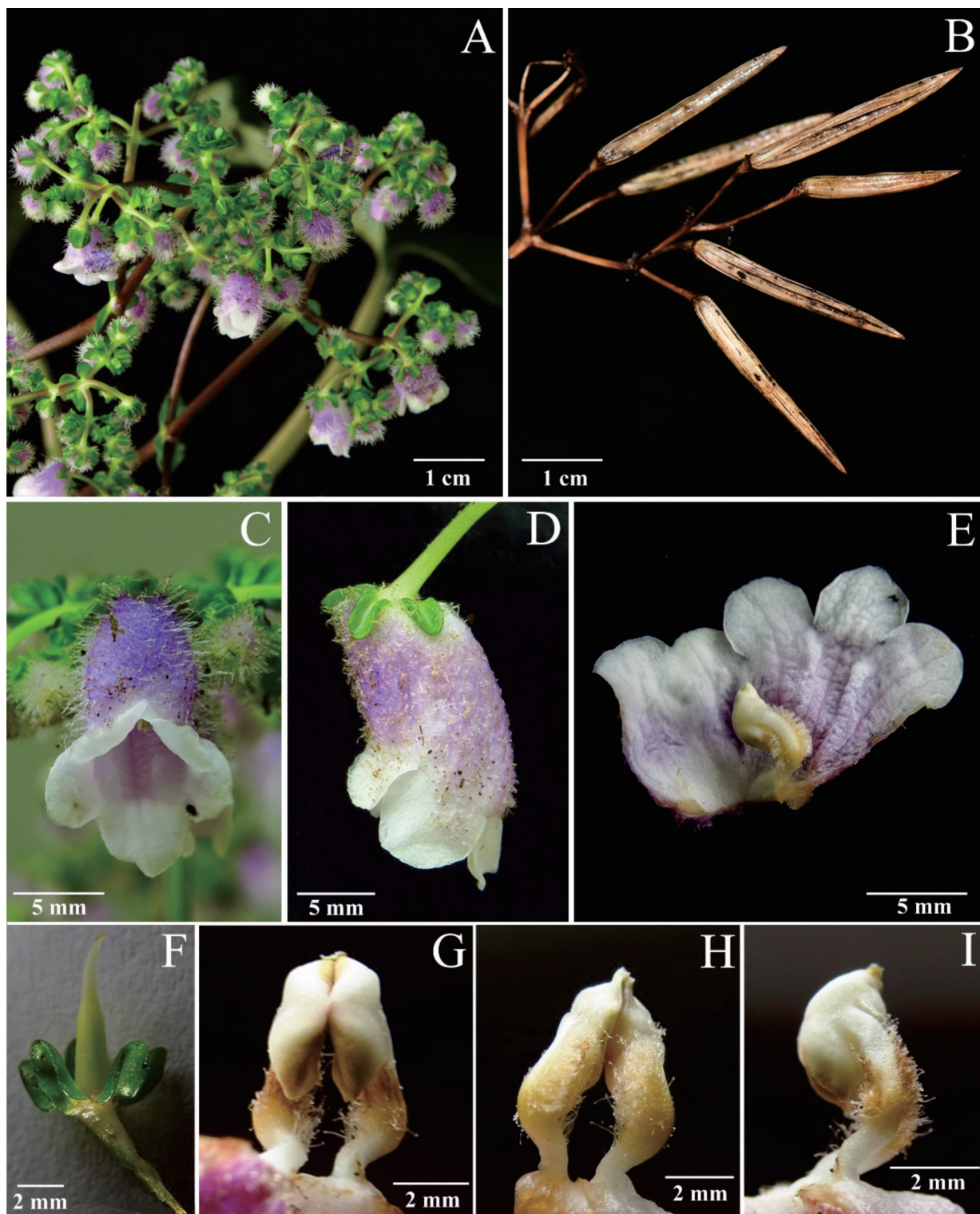
A. Habit with young fruits and flowers; B. Habit with old dehiscent fruits; C. Habit with flowers; D. A part of rhizome; E. Upper surface of leaf blade; F. Lower surface of leaf blade.

Fig. 2 *Paraboea minutiflora*

Corolla 9–12 mm long, obliquely campanulate, white and red-pink or pale purple-blue, densely glandular-pubescent outside, glabrous or sparsely pubescent

inside; tube 6–8 mm long, 4–6 mm in diameter at the mouth; the limb conspicuously 2-lipped, adaxial lip 2-lobed to near base, lobes round, 3–4 × ca. 3





A. A part of inflorescences; B. Capsules. C. Flower face view; D. Flower side view; E. Opened corolla showing stamens and staminodes; F. Pistil and calyx; G. Stamens face view; H. Stamens back view; I. Stamens side view.

Fig. 3 *Paraboea minutiflora*

mm, abaxial lip 3-lobed to over middle, lobes round,  $3.5-4.5 \times \text{ca. } 3.5$  mm. Stamens 2, adnate to the

corolla base; filaments  $4-4.5$  mm long, densely glandular-bearded at the middle; anthers adnate face

to face, elliptic, 3.0 – 3.3 mm long, glabrous; staminodes 3, glandular-puberulent, lateral ones 1.0 mm long, adnate to ca. 1 mm above the corolla tube base; middle one ca. 0.2 mm long, adnate to the corolla tube base. Pistil glabrous, ovary 4 – 5 mm long, ca. 1.5 mm in diameter, style 4–5 mm long, stigma slightly capitate. Capsule straight, 1.2–2.8 cm long, ca. 2 mm in diameter, glabrous (old dehiscent fruit).

**Distribution and habitat:** *Paraboea minutiflora* is found from Ha Giang, northern Vietnam and southeastern Yunnan, China, and only four localities have so far been identified during field investigations. *Paraboea minutiflora* grows under the forests of limestone karst, at an elevation between 600 m and 1 100 m.

**Phenology:** Flowering from February to June.

**Notes:** *Paraboea minutiflora* is similar to *Paraboea thorelii* (Pellegr.) B. L. Burtt and species in the *Paraboea martinii* (H. Lev. & Vaniot) B. L. Burtt group, but it is easily distinguished from the latter by some characters (Middleton, 2018). *Paraboea minutiflora* is also most similar to *Paraboea glanduliflora* Barnett in having glabrous, reflexed calyx and corolla with glandular hairs (Xu et al., 2008; Wang et al., 2012), but differs from the latter by the upper leaf surfaces covered with brown matted indumentum when young, but glabrescent at maturity (vs. pubescent), the inflorescences terminal (vs. subterminal), the corolla 9–12 mm long (vs. 18 mm long), the capsule straight, 1.2 – 2.8 cm long (vs. spirally twisted, 3–4 cm long).

**Additional specimens examined:** CHINA.

**Yunnan:** Malipo County, Tianbao Town, 22°59'24.20" N, 104°50'12.14" E, alt. 1 100 m, 20 June 2018, Meng-Qi Han & Wei-Bin Xu 13883 (IBK). The same locality, 10 January 2019, Xin-Xin Zhu & Wei-Bin Xu 13916 (IBK). **VIETNAM. Ha Giang:** Quan Ba, 104°56'01.4" E, 23°02'55.0" N, alt. 900–980 m, 18 October 2018, Leonid V. Averyanov et al. VR1000 (LE01049022); Phong Quang, 104°54'57.4" E, 22°53'51.5" N, alt. 650 m, 17 August 2019, Wei-Bin

Xu et al. 13931 (IBK & HN).

The flora of Sino-Vietnamese limestone karsts belongs to the Tonkin gulf region in Paleotropic Kingdom (Wu et al., 2010), and also rich in rare and endemic plants. In recent years, many new genera or species were found firstly from northern Vietnam, and also found from southern or southwestern China at last, e.g. *Caobangia* A. R. Smith & X. C. Zhang (Xu et al., 2008), *Xanthocypris* Farjon & Hiep (Meng et al., 2013), *Zeuxinella* Aver. (Huang et al., 2012), *Aspidistra connata* H. -J. Tillich (Xu et al., 2010), *Didymoplexis vietnamica* Ormd. (Huang et al., 2011), *Sciaphila stellata* Aver. (Jiang et al., 2011), and also including *Paraboea minutiflora* D. J. Middleton here. The discovery of *Paraboea minutiflora* D. J. Middleton from Southeast Yunnan, China enlarge its distribution localities, and is also important to its research and conservation. Its biogeographical significance here, the flora is closely interrelated between the southern and southwestern limestone karsts of China and the northern limestone karsts of Vietnam. Sino-Vietnamese limestone karsts are naturally integrated areas, and the border just an artificial line, can not givesalient vicariations to those local wildlife. The biodiversity of Sino-Vietnamese limestone karsts is so fantastic, but the field surveys are weak, even blank in some areas, and many species face to severe threats at the same time, so more further research and conservation works are needed.

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